The trend of these annual cycles seem to be toward a heavier pressure on summer grazing lands because of increased stock numbers and moving the herds to the ranges at still earlier dates. This is a result of several factors: a) the need for increased security met by economic use of marginal land and grazing periods, b) population growth, c) new agricultural technology resulting in an increase in irrigated land for growing of cash crops rather than animal fodder, and d) new-felt consumer needs that demand more intensive exploitation of resources (Barth, 1977).

The general effect of too early grazing on rangelands with low annual rainfall is as follows:

The most critical time in a plant's growth cycle is the period when it emerges from dormancy. For annual species, heavy defoliation during time of flowering and seed set reduces or prevents seed production, meaning that there will be fewer plants and less forage the following year. Continual and excessive defoliation of perennial plants during their period of re-building carbohydrate reserves causes serious damage to their health and vigor, thus reducing productivity. If this continues over a succession of years, the plant will eventually die. Research shows that bi-monthly defoliation of grass results in a superior forage production, carrying capacity and livestock production than weekly grazing (Huss, 1977). This points towards a deferred grazing system, discussed in Section 2.4.

2.3.2. Uprooting of shrubs

In Afghanistan, where only a small portion of the country is forested, the scarcity of fuel is strikingly apparent. People living in the central highlands have as their only source of fuel for heating and cooking steppic shrubs and semi-shrubs and manure from their livestock. As the manure is also of immense value as fertilizer, heavier use is made of the small shrubs. The genera most utilized are *Acantholimon*, *Acanthophyllum*, *Artemisia*, *Cousinia*,





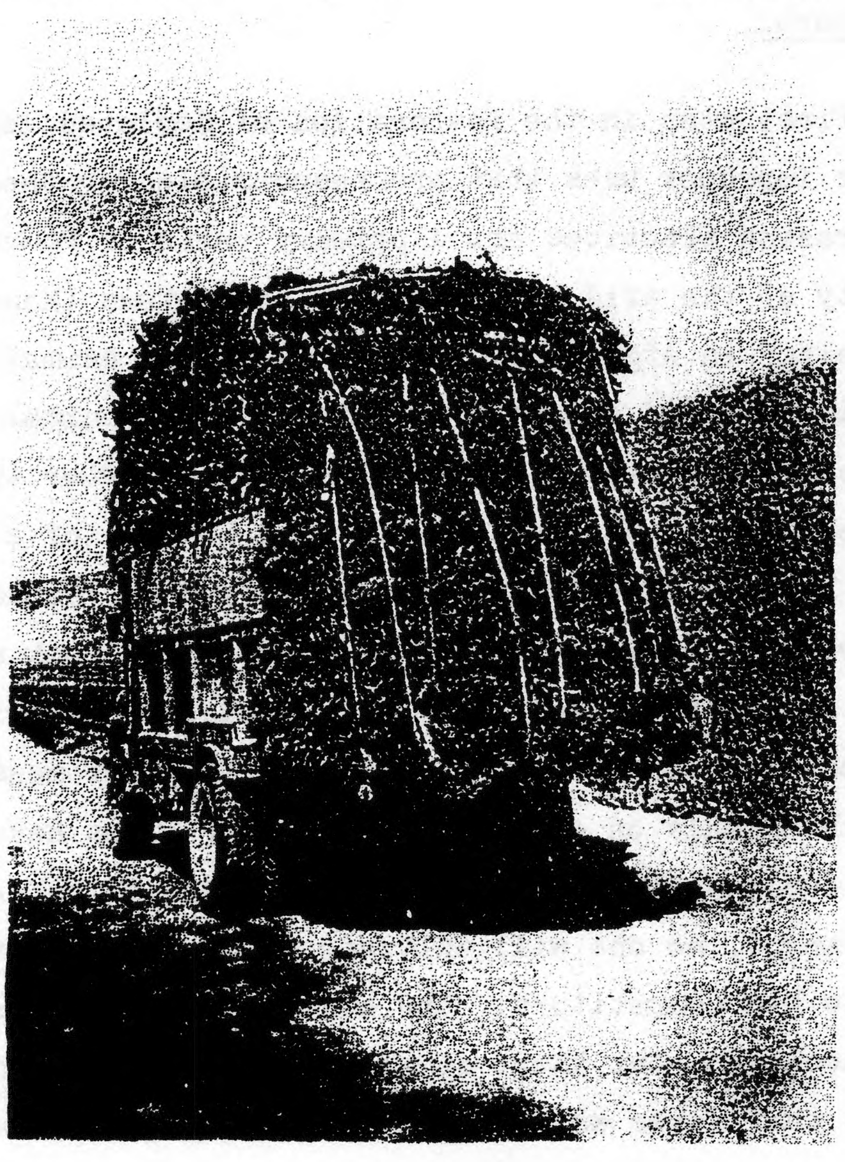


Figure 5, 6 and 7. Uprooting of shrubs for fuel consumption is a threat to Afghan range ecosystems. Large stacks of shrubs carried by donkeys, stored on roof tops and shipped by trucks are examples of the considerable amount of organic matter removed yearly from the already sparsely vegetated lands.

Astragalus and Ephedra, some of which form large cushions on the high steppes. According to the availability of these plants with a substantial woody part, anything with a woody stem or base is utilized. The plants are dug up with their roots, and carried by hand or on donkey back (Figure 5) to winter quarters where they are stored on the roofs of houses (Figure 6). Around areas of major human concentrations even this fuel source is becoming scarce and has to be brought to population centers by truck (Figure 7).

The overall effect of these practices is one of severe range deterioration. First, the predominance of low, woody shrubs is regarded as a seral stage already deteriorated from grass steppe communities (Section 2.1.). Further deterioration by this reverse succession will inevitably lead to seral stages of a still lower rank, ultimately reverting to ground devoid of vegetation. The shrubs, although largely unpalatable to domestic animals, play an important role in stabilizing the soil against wind and water erosion, in protecting palatable herbs and grasses in the community and in supplying valuable organic matter to the soil.

2.3.3. Dry-farming

Although over-grazing and brush-collecting are the most serious abuses to the rangelands, certain other activities, particularly dry-farming exert noticeable impact. As the only possible method for growing crops in vast areas of the region, there is no substitute for this at present. A dry-farmed area (lalmi) is cleared of shrubs and other vegetation and the soil is loosened on the surface by light, wooden plows that do not upset the existing capillary system in the soil structure. Sowing, mainly of wheat, is done in April and May when the soil is still moist. After sowing, no further attention is required except for protection against grazing animals. By the end of August the crop is ready for harvesting. However, stalks are usually thinly dispersed and only about 1/2m in height, with

low yields of grain. After use, the field is abandoned from three to five years to recover before it may be sown again. During this period the soil is bare and subject to erosion. Upon complete exhaustion of the soil, the area is permanently abandoned and a very slow regeneration starts to take place, usually with the invasion of Artemisia spp. and the unpalatable Launea tomentella. In the Hazarajat, dry-farming is very common and in certain places the landscape is dominated by large areas of bare soil that show signs of incipient erosion.

2.4. Measures to be considered for range improvement

2.4.1. General

The first step in the restoration of depleted vegetation is to correct the improper uses that are responsible for these conditions. Improper grazing practices are a primary cause of reduction productivity of the arid and semi-arid ecosystems (Hassanyar, 1977). A common belief in Afghanistan is that the more animals there are, the more meat is produced and that a high number of animals before a drought will also secure a comparatively larger number after the drought. In a rural society, the number of animals is a measure of a man's wealth and determines his position in the social hierarchy. To tamper with these concepts by implementing a general reduction in stock numbers will serve no purpose except to increase poverty, create sociological problems and generate hostility towards other range improvement measures. Herdsmen working with animals on open range all their lives have a certain insight into range ecology, but being in competition with other families and tribes about the ranges, no one will initiate sound management practices for fear of losing to his competitors. The concept of general range deterioration is widely accepted, but there is a need to introduce and make understood the concept that fewer animals will produce more meat and that deferred grazing will improve range conditions.

Deferment is one of the more rapid and assured methods of attaining natural improvement. It is defined as "delay or discontinuance of livestock grazing on an area for an adequate period of time to provide for plant reproduction, establishment of new plants or restoration of vigor of existing plants" (Huss, 1977). Such practices have been introduced in many other countries but as yet these occur mostly on an experimental basis. In some instances, deferment together with proper stocking, has resulted in denser vegetation cover and palatable shrubs have increased in vigor, size and productivity in only two years. Annual legumes and grasses also increased and a few perennial grasses began to reestablish themselves (Huss, 1977).

To introduce this system in Afghanistan will be a complex task involving the assistance of sociologists, extension services, range ecologists and planners. However, considering the serious nature of the problems in a country facing the threat of widespread desertification, there should be no lack of willingness among the authorities to consider the initiation of a deferred grazing system. This could be based on a model of the traditional hema grazing system, where a grazing reserve was controlled by a family or tribe who determined its period of deferment and method of use.

Another point to consider is that ever-expanding cultivation is a major factor contributing to over-grazing. Large areas of Afghanistan's best rangelands are subject to irrigation development schemes which have resulted in more animals now grazing areas of less productive pastures. As there is a strong tendency to grow cash crops such as cotton and wheat on irrigated field the forage lost to cultivation is not replaced. Past experience strongly indicates that future planning of irrigation and agricultural development should include the range aspect in order to maintain a sound equilibrium between agricultural development and range management practices.

The possibility of soil scarification and re-seeding as Pabot (1967) suggests for certain areas in Iran should be included in future, more intensive studies. It is still too early to apply these measures to Afghan rangelands, other than on a purely experimental basis.

2.4.2. Reference area

In order to accomplish meaningful work in the restoration of Afghan rangelands it seems imperative to establish a reference area for monitoring general range development. The reference area should ideally be subject to correct grazing pressure for a sufficient period of time to allow range vegetation to develop that can be considered optimal under the prevailing climatic conditions. Regular inventories of the reference and monitor areas will reveal developmental trends and provide guidance for corrective measures for general range improvement in Afghanistan. A major question is a proper definition of "correct grazing pressure". Research applicable to conditions in Afghanistan has yet to be done, and to provide required data will take considerable time and effort. At present the best approximation seems to be the seasonal utilization by wild animals, assuming that the pressure on rangelands by wildlife in Afghanistan is far more in balance with actual carrying capacity than that exerted by expanding domestic stocks.

A suitable site is the Ajar Valley Wildlife Reserve, an area of 5000 ha located in the center of a region heavily used by domestic animals. It has been protected for nearly 30 years as a wildlife and hunting reserve and the area's use by domestic stock has been minimal during that period. Before protection, the area was heavily utilized for grazing and dry-farming at least to the same degree as is presently exerted outside the Reserve (Abdul Haq, 1978, pers, comm.).

Range surveys performed on two occasions in autumn 1977 and one in spring 1973 have resulted in a vegetation inventory (Appendix I) and assessment of the present degree of range utilization (Section 5). Although the information collected is not exhaustive, there are strong indications of a general improvement of range conditions within the reserve area. This assumption is based on comparison with adjacent areas and the plant successions on abandoned dry-farmed fields as opposed to adjacent rangeland. An apparent invasion of sedges and grasses in lower regions has resulted in a community type that may be considered a seral stage in development towards a grass steppe community. Reports from the Kohe Hadzrat-i-Baba area in Herat province (R. Petocz, 1977, pers. comm.) indicate that the rangeland which has been protected by the military for about 40 years, has vegetation characteristics of a grass steppe. Further protection and monitoring of the Ajar Valley Wildlife Reserve will confirm whether such plant succession actually takes place in these parts of Afghanistan as already suggested by Dieterle (1973). This would also be a first step towards establishing a basis for general range management policies.

3. STATUS OF THE RANGES WITHIN THE RESERVE AREA

The Ajar Valley Wildlife Reserve has been protected for nearly 30 years and hunting by local people and grazing of domestic stock has been held to a minimum (FAO, 1977, Project Field Document No. 4). This accounts for a more natural range development within the reserve area than in the surrounding districts. Since the area is inhabited by an estimated 5000 ibex (FAO, 1977, Project Field Document No. 4), a certain grazing pressure is exerted on these rangelands, the extent of which is discussed in Section 3.2. The ranges of the area, therefore, have not developed completely unchecked, but rather within the framework of a natural seasonal utilization. Its present status can provide a base for comparison with surrounding rangelands which suffer from

apparently un-balanced grazing intensities by domestic stock.

3.1. Physical Features

3.1.1. Climate

Climatic conditions vary considerably within the reserve area, according to elevation and exposure. Lower sections near the lodge are comparable to Bamiyan (Table 1), whereas sections at higher elevations have more extreme conditions with lower temperatures and higher precipitation, similar to conditions at Bande Amir (Table 1). Average temperature and precipitation are therefore of limited interest, since they are representative of only a small portion of the area. Temperatures are estimated between a maximum of 31°C and 28° and a minimum of -31.5° -40°C. at lower and higher elevations respectively. Temperature conditions are thus very harsh at the higher elevations above Jawzari Canyon. Prevailing wind direction from December to June is from the west (Dieterle, 1973), implying that wind and snowdrift act at full force in the east-west oriented plateau basin above the Canyon. Precipitation varies from an estimated yearly average of some 160 mm in the valley bottom to over 400 mm in the upper, mountainous sections where it falls mainly as snow. Average relative air humidity varies between 50 and 60 %, but may in summer sink to 15% during midday (Dieterle, 1973).

Table 1. Meteorological data from Bamiyan, Panjaw and Lal. Data from Bamiyan and Bande Amir are courtesy of the Meteorological Institute, Ministry of Transport. Data for Panjaw and Lal are from Dieterle (1973).

	Elevation	Latitude °N	Longitude °E	Precipitation (mm)	No Rainy days	Precipitation min/max	Dry months	Mean temperature °C	Absolute temperature min/max	Mean temperature coldest month	Mean temperature warmest month	Frost days per year	No. of observed years
BAMIYAN	2550	34°50'	67°50'	162						-12.8	26.4		6
PANJAW	2700	34°25'	67°00'	320	87	165/455	4-5	3.5	-40.4 31.5	-14.9	27.6	215	$3\frac{1}{4}$
LAL	2800	34°30'	66°20'	293.5	85		4-5	3.9	-45.0 30.4	-13.8	15.6	250	4
BANDE AMIR	2920	34°50'	67°10'										

3.1.2. Substrate

The mountains of the Ajar Valley are of Oligocene and Miocene age, dominated by massive limestones. Reddish conglomerates and sandstones are found in the Surkhak Bowl and along the main Ajar Valley, limey shales occur at Lacho Khana and the western parts of Jawzari Canyon and at the higher elevations of Kohe Jawzari (Weippert, 1964). The geological substrate exerts, however, only a minor influence on vegetation composition as other ecological factors are far more dominant (Section 2.2.). Soils are generally sparsely developed, rock outcrops are common at higher elevations and large deposits of sand and gravel are found only below cliff-faces. Over the limestone plateaus the soil is everywhere quite shallow, 10-50 cm thick, has no horizontal zonation and a humus layer is either completely lacking or else very sparse. Soil depth is of vital importance for the development of root systems of grasses and shrubs. Whereas some of the native grasses of the high steppes require very deep soils (the root systems of Stipa may reach 1 m in depth), others like Poa bulbosa require only 30 cm deep soil and are therefore much more common in the Ajar Valley. The low cushion-shrubs have their natural sites on shallow and rocky soils. Geophytes and annuals all have a shallow root system and are thus not affected by soil depth. As the open vegetation of the cushion-shrubland gives very little protection against erosion as compared to the thick mats of grass root-systems, soil development without vegetation regeneration is hardly possible.

3.1.3. Topography

The Ajar Valley Wildlife Reserve lies at the head of a long east-west running valley. Just west of the easternmost reserve boundary the valley proper terminates in vertical cliff-faces 350 m high. A narrow

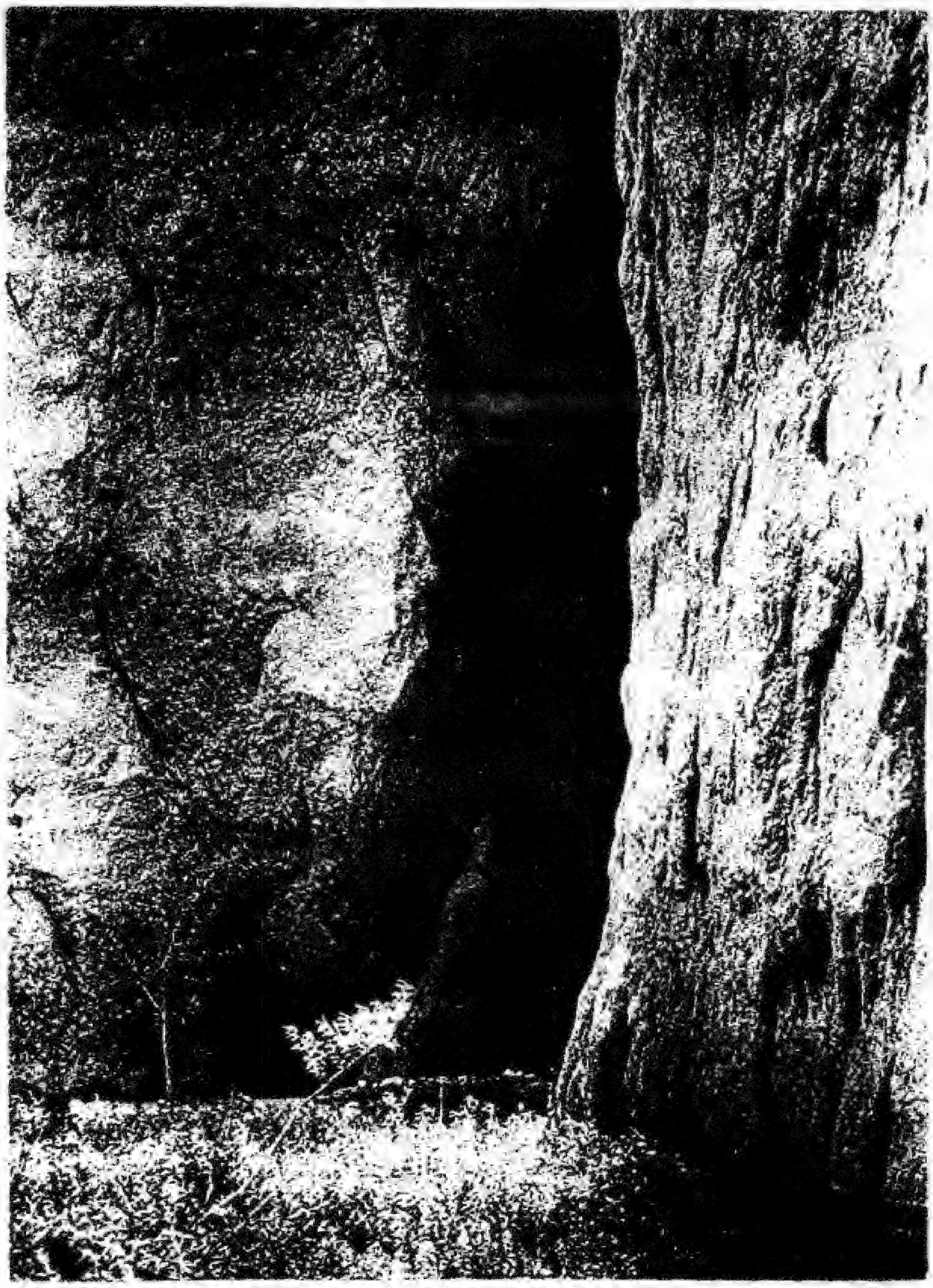


Figure 8. The Ajar River emerges as a spring directly from the canyon wall. The site is the famous shrine of Chiltan, regularly visited by local people.



Figure 9. View from Lachakhana of the high plateaus on either side of Jawzari Canyon.

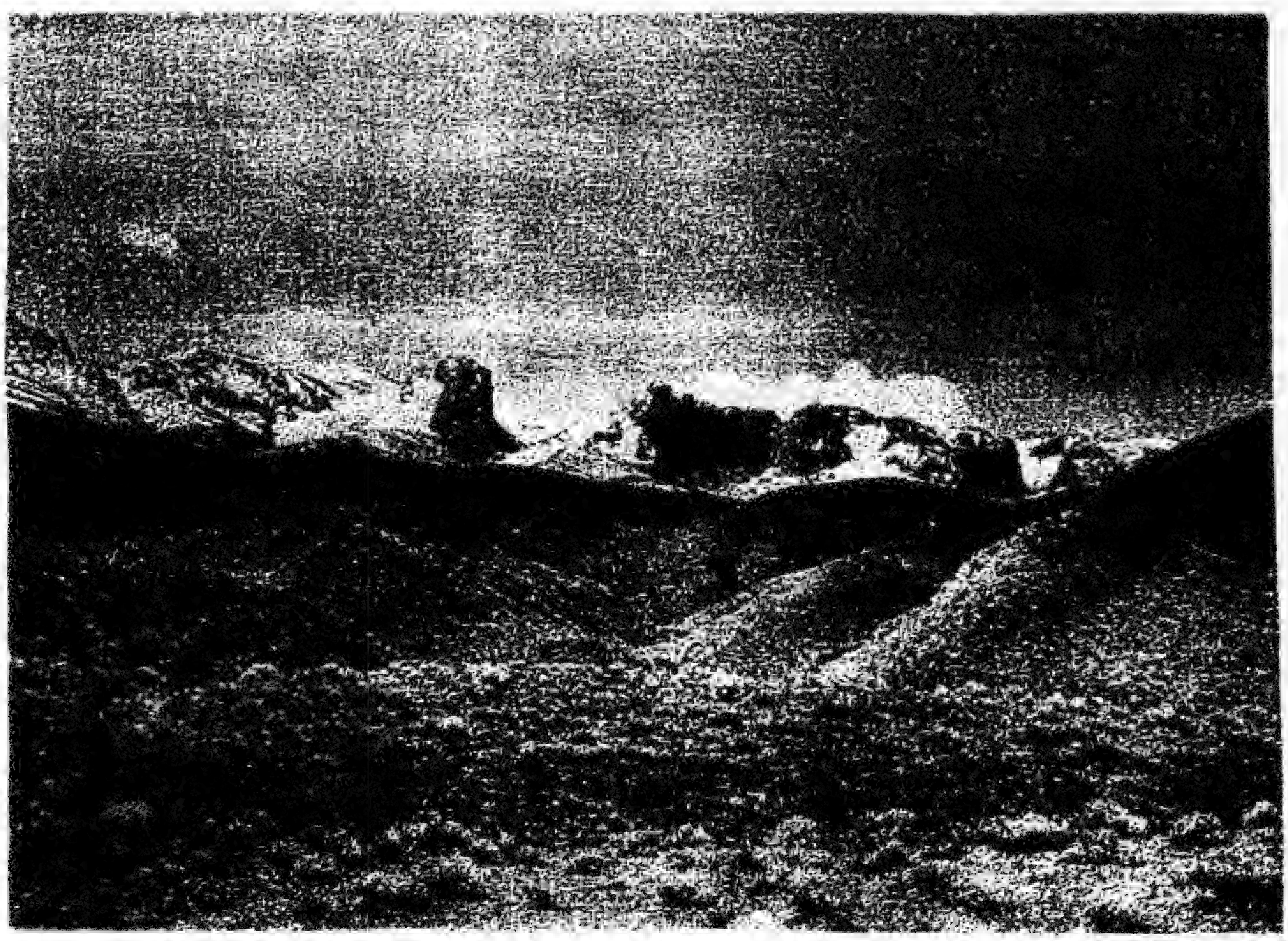


Figure 10. The Ephedra steppe north of Jawzari Canyon is little utilized for winter browsing by ibex in spite of light snow-cover.

gorge, the start of Jawzari canyon that bisects the Reserve from east to west, cuts through these cliffs with numerous branches running at right angles to the main canyon. The canyon has been formed by water erosion as the Ajar River cut its way down through soft limestone rocks. In the recent geological past the river became subterranean, leaving Jawzari Canyon dry. The river now emerges directly out of the rock wall on the canyon side (Figure 8) and forms the small Chiltan Lake at the mouth of the canyon, after which it flows out into the broad, fertile Ajar Valley with willow-covered banks and cultivated fields on either side.

The canyon bottom rises gently for abo t four kilometers where it branches off into the Surkhak Bowl, while the main section slopes down into the western part of the Reserve. Only at this high point is it possible to gain access to the plateaus on either side of the canyon. The plateaus, from one to five km wide, rise gradually towards the higher mountains that rise to 3800 m. (Figure 9). The plateaus are interspersed with north-south running minor branches of the main canyon which cause serious obstacles to anyone wishing to traverse the plateaus in an east-west direction. These canyons provide excellent shelter, grazing grounds and a seasonal water supply for the ibex population.

Total relief within the reserve area is nearly 1800 m from the bottom of the Ajar Valley at about 2000 m to Kohe Bande Yakh that rises to 3800 m. The plateaus range from 2400 m to 2900 m and cover in total about one-third of the reserve area. The remainder consists of canyons, cliffs and screes, rounded, vegetated mountains and rocky peaks. A small portion of the Ajar Valley proper is included within the reserve boundaries.

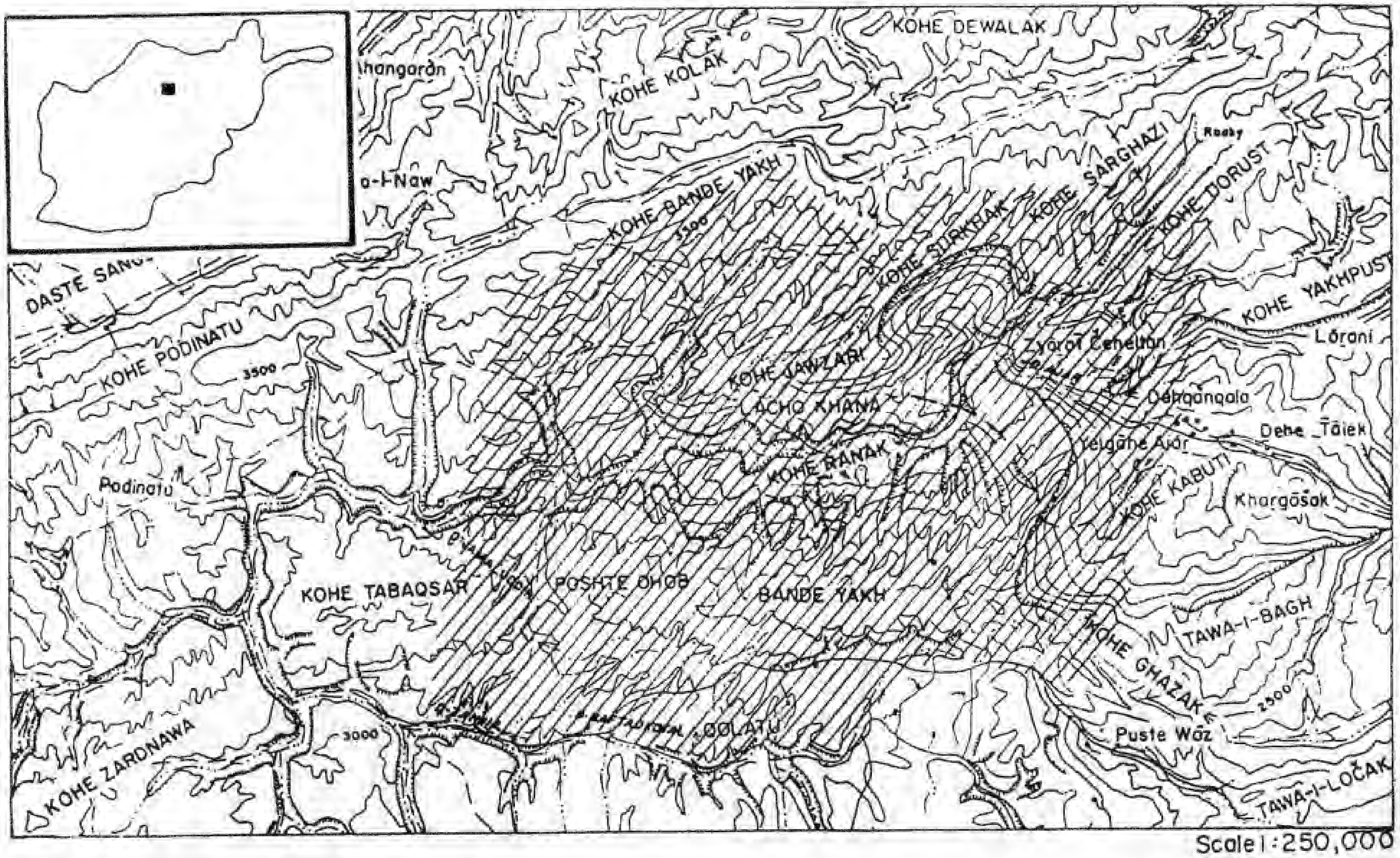


Figure 1. Map of the Ajar Valley Wildlife Reserve.
Hatched area indicates approximate size of reserve.
Drafting courtesy of the Institute of Environment, Department of Forests and Range, Ministry of Agriculture.

1. INTRODUCTION

The flora of Afghanistan has been and remains a challenge to botanists, particularly taxonomists. Over the years several botanists have visited Afghanistan and published valuable material on the flora of the country (Freitag, 1971; Breckle and Frey, 1974; Volk, 1954; Dieterle, 1973; Gilli, 1969, etc.). These works have, however, primarily a taxonomic/systematic approach, although attempts have been made at an ecological classification of the country (Freitag, 1971). Very little data exist on the status and ecology of the range flora and no work has yet been done on the flora of Ajar Valley in particular. Due to heavy utilization pressure the range flora of the central Afghanistan mountains is in a state of deterioration and processes of local desertification have begun throughout the country (Hassanyar, 1977). This is a matter of serious concern. Unfortunately, basic reference material for plant identification is either lacking or inaccessible to a non-specialist, making range surveying a cumbersome task, accentuated by the lack of reference areas whereby range development could be monitored. The Ajar Valley Wildlife Reserve (Figure 1) was a former royal hunting reserve and is located in the Hazarajat mountains of the western Hindu Kush. Prior to the establishment of the new government on 27 April 1978, the area was managed by the Republican Guard (Guard-i-Jamhouriat). The area now comes under the jurisdiction of the Ministry of Agriculture and will be managed as a Wildlife Reserve by the Directorate of National Parks and Wildlife. It will thus continue to enjoy the protected status, initiated nearly three decades ago. The FAO National Parks and Utilization of Wildlife Resources project has made extensive studies of the wildlife populations in the area and has supplied information on the historical background and present status of the Reserve with recommendations for management (Skogland, 1976,

3.1.4. Water

A permanent water supply is scarce in the area. Only four localities have been registered that satisfy the demand for a year-round constant supply (Appendix I). First is the Ajar River, which is probably not utilized by ibex to any extent due to its proximity to human settlements and traffic on the hiking trail. Second are several springs which emerge from the lower slopes of the Surkhak Bowl and flow together to form an all-year creek that is diverted westwards into the canyon during summer. This is apparently a major source of water for animals in the central parts of the Reserve. Numerous well-used trails on the steep canyon walls and on the overlying plateaus indicate that ibex come down to the canyon bottoms from higher grazing grounds to drink, especially in the early mornings. A third set of springs is found under Kohe Yakhpust that flows directly down into the Ajar River. Upper parts of this water source are reported by locals to be utilized by ibex in early mornings despite human activity (dry-farming, sheep grazing) in the area. The fourth water source occurs in the high valley south of the lodge, Chawgasar Bowl, which is heavily utilized by year-round human settlements, irrigated farming and grazing of domestic stock during the day-time. Nevertheless, this source is thought to be used by the ibex population in this part of the Reserve as ibex are believed to be nocturnal grazers in summer (Skogland, 1976).

Although these water-sources must be heavily utilized both by ibex and other wild animals, partly in competition with domestic stock, signs of habitat destruction in the environs of the waters were not observed.

3.2. Wildlife Impact

3.2.1. Summer Utilization

Use of the available rangelands by ibex during summer is determined by general habitat preference, availability of water and grazing patterns of domestic stock that intrude on the Reserve. During spring (Mid-April) ibex show a preference for patches of *Carex stenophylla* meadow in the *Acantholimon* steppe between 2500 and 2800 m where *Festuca ovina* and *Carex stenophylla* represent the most favored species. Light browsing on young shoots of *Artemisia* spp. was also observed. At this time of the year, snow extends below 3000 m in the Reserve which precluded use by ibex of rangeland at higher elevations. As snow-melt proceeds with subsequent vegetation development at higher altitudes, the ibex move to higher grazing grounds that have a more dense cover of favored species of grasses and sedges.

The *Carex stenophylla* meadows are mainly found above 2800 m. Skogland (1976) noted that ibex seemed to prefer what he termed "short-tall grass steppe" that generally corresponds to *Carex stenophylla* meadow habitat with a normalized preference of 61% for the period April-June. These observations are confirmed by the general trend of animals to seek vegetation in an early stage of development with higher palatability and protein content. Due to prolonged snow cover and better summer moisture reginos this is the case of plants of the *Carex stenophylla* meadows for a longer period into the summer than of any other habitat of the Reserve.

Preferred habitat utilization by ibex in the Ajar Valley during late summer and autumn is little know. However, forage utilization then is expected to shift from grazing grasses and sedges to browsing shrubs and semi-shrubs as the availability of more palatable plants of spring and early summer decreases whereas the majority of steppic shrubs are still in their growing period. This is confirmed by observation of Siberian

ibex (Capra ibex siberians) in the Afghan Pamir where groups were found to prefer alpine steppes over sedge meadows (FAO, 1978, Project Field Document No. 8). A daily utilization pattern seems apparent. From grazing at lower elevations near water sources at night and early mornings, ibex gradually move upwards while feeding, to finally rest on top of scree slopes and under cliffs during the middle of the day.

3.2.2. Winter utilization

Skogland (1976) assumed that during deep snow periods in mid-winter, ibex are forced to aggregate in lower parts of the range, and quickly over-exploit the vegetation. A spring survey was, therefore, performed in April to assess the degree of range utilization by ibex during winter. No signs of over-exploitation were seen during this survey, except localized overgrazing on a few ridges in the Acantholimon steppe where Ephedra sp. was very heavily browsed. Artemisia lehmanniana had also been more utilized than observed elsewhere. These conditions were, however, only found locally and large ridge areas where snow drifts off in winter and exposes the vegetation to browsing by ibex were still in good condition. The Ephedra steppe north of Jawzari Canyon had been very little used (Figure 10) in spite of the very light snow cover, only 4-5 cm, and the fact that Ephedra is a favored source of food for ibex during winter because of its high salt content (Abdul Bakhi, 1978, pers. comm.).

Great care should be taken in drawing generalized conclusions based on a one-week survey where only limited data were obtained. However, it seems reasonable to state that ibex do not over-utilize the eastern half of the Reserve during winter. On the contrary, ranges appeared in good condition and all animals observed seemed to be in good physical condition. Possible explanations are that the number of animals utilizing the rangeland is well below carrying capacity for the area, or that ibex move to other parts of the Reserve or even out of the Reserve in winter.

3.3. Human impact

The main valley east of the Reserve contains fertile irrigated land and is intensively farmed. The number of people living within the reserve area is not known, but probably does not exceed 500 individuals, most of whom are concentrated in the valley bottom in the eastern portion of the Reserve, near the lodge, and in the Ghawgasar Bowl. A major trail through Jawzari Canyon connects the Ajar Valley with settlements further west and is used by travelers and tradesmen. The shrine of Chiltan, located where the Ajar River flows out of the canyon wall, is frequently visited by local people. They come to honor the saint who according to tradition entered the spring and found 40 people in a subterranean room reading the Holy Koran. One family inhabits the canyon where the creek emerges from the Surkhak Bowl and farms the canyon bottom during summer and fall, also keeping a small number of sheep and cattle.

3.3.1. Dry-farming

Dry-farming at present is only practised under Kohe Yakhpust north of the village of Dehqanqala. Large areas below the cliff-face are either being farmed or were in the recent past, leaving the land almost void of vegetation. Surprisingly steep slopes are farmed, with an inclination estimated at more than 30%. However, signs of erosion gullies were not seen. On the other hand, it is highly probable that sheet erosion takes place, i.e., heavy rain-fall alters the structure of the loose, dusty top-soil and separates it from underlying soil, causing thin layers of wet sand and dust to slide down the slopes. On previously dry-farmed land there is no vegetation or root-systems to bind the soil, which greatly facilitates this form of erosion. Some of the oldest <u>lalmis</u> are now being invaded by natural vegetation, such as <u>Artemisia lehmanniana</u> and <u>Launea tomentella</u>, but succession is slow.

3.3.2. Grazing domestic stock

Since the early 1950's all grazing of domestic stock has been forbidden within the reserve boundaries. However, as the boundaries at present are rather vaguely described, domestic animals graze the eastern fringes of the Reserve, under Kohe Yakhpust and in the Chawgacar Bowl, and cattle graze the valley bottom on both sides of the Ajar River between the lodge and the canyon. The family living in Jawzari Canyon pastures a small number of sheep and cows in the canyon bottom. About 100 donkeys and cattle owned by caretakers and farmers are grazed in the Reserve, together with 200-300 sheep owned by the reserve authorities (FAO, 1977, Project Field Document No. 4). The effect of this utilization is minimal; however, competition between domestic and wild stock may arise in the vicinity of water. As domestic animals heavily utilize the land around three of the four water sources in the area and are also present at the fourth, they may well be a disturbing factor to the ibex population.

3.3.3. Uprooting of shrubs

Lower regions of the Reserve have far less shrub cover than the higher, more inaccessible regions. A major reason for this is probably more precipitation at higher elevations, but one would suspect that the uprooting of shrubs is a contributing factor. Donkey-loads of *Arthrophytum griffithii* have been observed moving out of the Reserve, but the extent of the shrub harvest is not exactly known. However, the effect of uprooting is far less evident than in other areas of the Hazarajat and the inaccessibility of the large portions of the Reserve should keep this practice at a low level.

4. PREDOMINANT PLANT COMMUNITIES WITH NOTES ON THEIR ECOLOGY AND FORAGE VALUE

The vegetation of the Ajar Valley Wildlife Reserve ranges from lush stream-side willow shrub to desert-like Ephedra steppe (Appendix I). There appears to be a distinct altitudinal zonation as regards species composition and dominant plant communities. This zonation is highly affected by exposure so that any given community will occur at elevations 200-300 m higher on south-facing mountain slopes than on north-facing ones. Similarly the alpine Carex stenophylla community which is a favored grazing land for ibex descends to 2800 m on north-facing slopes, but is not found below 3200 m on south-facing slopes. This zonation is typical of the vegetation composition throughout the central Afghanistan highlands, but is far more apparent in the Ajar Valley than elsewhere because it has been less modified by human impact.

The plant communities are classified according to characteristic species and are somewhat generalized. There are with few exceptions, no abrupt changes in species composition, but rather broad transition zones occur between typical community compositions. A more intensive mapping method might reveal the presence of additional communities characterized by species such as Stipa szowitsiana or Cousinia polyneura. These species, although described by Gilli (1969) as forming distinct communities at certain elevations, were found dispersed within the Acantholimon steppe as well as in the Carex stenophylla meadow and Juniperus excelsea woodland. Nearly pure stands of Artemisia lehmanniana are occasionally found, but they are here regarded as transition zone between Zygophyllum and Acantholimon steppes.

The following plant communities were recognized, listed according to occurrence in the elevation zonation:

1- River-bank willow community

Along the Ajar River starting at the Chiltan spring and continuing into the main Ajar Valley is found a stream-side shrub community dominated by willows (*Salix* spp.). The number of species is high, as is biomass production; the vegetation cover is generally 100%. The most common plants in this community are: *Salix excelsea*, *S. pycnostachya*, *S. wilhelmsiana*, *Eleagnus angustifolia* *Tamarix* sp. *Myricaria germanica* *Taraxacum* sp., *Gentiana agnalica*, *Hypecoum pendulum*, *Gagea gageoides*, *Biebersteinia multifida*, *Hippohae rhamnoides*, *Berberis integerrima*, *Cerasus verrucosa*, *Rosa* sp., *Crataegus turkestanica*, *Mentha* sp, *Artemisia* spp., *Plantago lanceolata*, *Trifolium repens*, *Ranunculus* sp., *Carex cribicularis*, *Phragmites australis*, *Salvia* sp., *Equisetum* sp.

This habitat is heavily utilized by the small herd of Bactrian deer (*Cervus elaphus bactrianus*) that inhabits the valley bottom, in competition with domestic stock (Habibi, 1976). Forage value of the community is very high and regeneration is assured by a constant water supply. Ibex probably does not use this habitat to any extent.

2- Canyon-bottom scrub community

In the bottoms of the numerous canyons that dissect the high plateaus, a heterogenous type of vegetation has developed that does not constitute a distinct plant community, but is intermediate between steppic vegetation and stream-side vegetation. The canyons are flushed in spring and early summer, but later in the season no water is available. Therefore species typical of the dry steppes are found here together with the more drought-resistant species of the willow community. Common species are:

Zygophyllum atriplicoides, Cerasus verrucosa, Rosa spp., Arthrophytum griffithii, Atraphaxis sp., Berberis integerrima, Cotoneaster sp., Artemisia spp., Cousinia sp., Bromus sp., Poa bulbosa, Stipa sp. Juniperus excelsea, Lactuca sp.

A part of the canyon system is farmed and grazed by domestic stock but the major portion is prime ibex habitat. The animals frequently utilize this habitat as it provides shelter while they browse the shrubs and semi-shrubs. Forage value of this vegetation type is considered superior to that of the true steppes.

3- Ephedra steppe

This is a highly distinct community found on the south-facing slopes and plateaus north of Jawzari Canyon. It occurs on very dry soil with plants regularly dispersed 1-1.5 m apart, and sometimes in clusters 4-5 m apart. Only few species were recorded in this community, namely Ephedra sp., Bromus tomentellum, Artemisia lehmanniana Poa bulbosa, Gagea pseudoreticulate, Zygophyllum atriplicoides and Z. miniatum. Vegetation cover is 10-15%. The forage value of Ephedra is reported by locals to be high and in spite of the sparse vegetation cover this community has a considerable forage value.

4- Zygophyllum steppe

In lower portions of the plateaus occurs a plant community dominated by scattered shrubs which grow up to 1 m in height. Plants are dispersed 1.5-2 m apart and vegetation cover seldom exceeds 30%. The community occupies a zone between 2300 m and 2800 m on dry soil and occurs at higher elevations on south-facing slopes than on north-facing ones. Vegetation composition varies somewhat according to exposure. On south- and west-facing hillsides, only Zygophyllum atriplicoides and a few Artemisia lehmanniana occur, whereas north facing slopes may also have the odd

Acantholimon and Stipa, and usually Eremurus kaufmannii. Other species recorded were: Artrophytum griffithii, Atraphaxis sp., Euphorbia esyrides, Gagea setifolia and Pseudosedum sp. Forage value of this habitat is considered low. Zygophyllum is apparently not utilized to any extent and most of the ground not covered by these shrubs is bare soil and dust throughout most of the summer. It is considered one of the poorest ranges in the Reserve.

5- Acantholimon steppe

Above ca 2800 m Zygophyllum atriplicoides is gradually replaced by a low, thorny cushion-shrub community dominated by Acantholimon. Due to higher precipitation and a lower rate of evaporation, vegetation cover here is considerably better, generally 40-60%. Soils are shallow and rock outcrops common on hill-tops and ridges. Common plants are: Acantholimon, Artemisia lehmanniana, Ephedra intermedia, Astragulus spp., Acanthophyllum, Cousinia, Stipa szowitsiana, Artemisia spp., Camphorosma lessingii, Festuca ovina, Carex stenophylla, Tulipa polychrama, Scilla afghanica, Dionysia tapetedes, Melica canescens and Bromus sp.. This community covers large areas and species composition may vary according to elevation and exposure but Acantholimon and Artemisia lehmanniana are everywhere present. The good vegetation cover and comparatively high number of species present indicate that this habitat is of considerable forage value to ibex, although the plant biomass consists mainly of thorny and woody individuals. Interspersed in this community type are numerous patches of Carex stenophylla meadow. Observations made in April show that ibex prefer to graze these patches in the spring.

6- Carex stenophylla meadow

At the highest elevations and in depressions at lower elevations where snow accumulates and remains long into the spring a meadow community

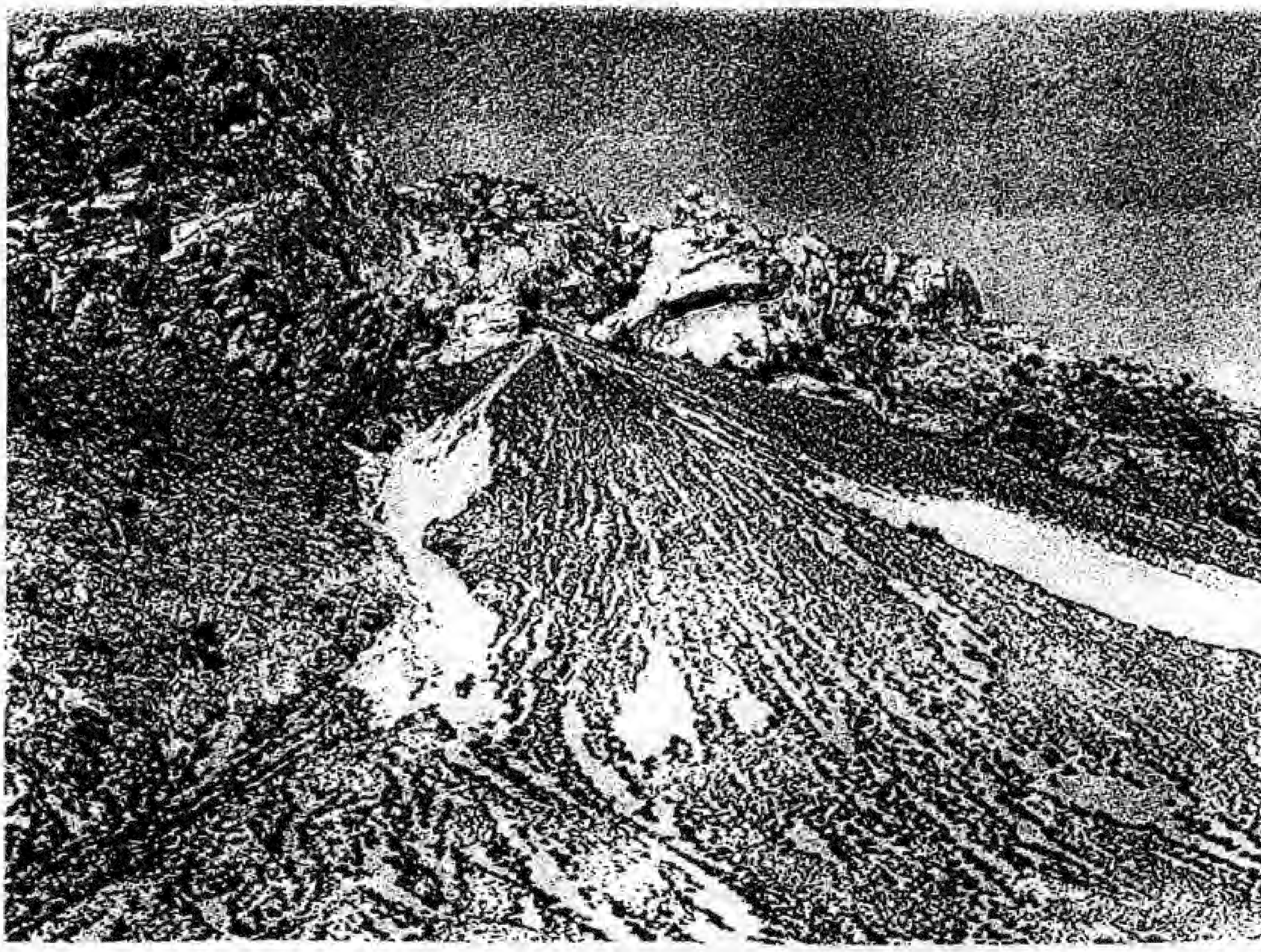


Figure 11. Remnants of Juniperus excelsea woodland occurring on rock cliffs in an inaccessible area. Below occur scree slopes with Zygophyllum atriplicoides and Artemisia spp.

occurs that is dominated by sedges and grasses. This plant community is dependent on soil moisture throughout a major part of the growing season and is to a large extent fed by snow-melt water. Although the number of species is not large, vegetation cover is extremely good, usually 70-100%. Dominant species in this community are: Carex stenophylla, Kobresia sp. Poa bulbosa, Cousinia sp., Ranunculus orientalis, Artemisia sp. and Festuca ovina. Most of the plant biomass consists of highly palatable species which, moreover, remain in good condition during a longer part of the season than other habitats except for the willow shrub. This habitat is therefore regarded as having the highest forage value of the reserve area for ibex. Because of its vigorous root-system, Carex stenophylla tolerates heavy grazing and is thus of vital importance for animal husbandry in general (Tolmacher, 1965).

7- Juniperus excelsea woodland

Scattered throughout the reserve area, from the bottom of Jawzari Canyon to an elevation of ca 3000 m are remnants of woodlands, which now occur only in the most inaccessible areas (Figure 11). The floral composition of this habitat resembles that of the steppe. Keeping in mind the laborious and continuous hunt for fuel in the Hazarajat, it could well be that the areas now classified as Acantholimon steppe were once Juniperus woodland, decimated through over-exploitation. Common species in this habitat are: Juniperus excelsea, Acantholimon, Stipa szowitsian, Cousinia, and Rosa sp.

Forage value of this habitat is equal to that of the Acantholimon steppe, and is also probably used as shelter by wild animals, both against the strong sun in summer and blizzards in winter.

8- Bare rock

At higher elevations and along canyon sides are found frequent rock outcrops with hardly any vegetation cover. Occasionally Rosa sp.,

and FAO, 1977, Project Field Document No. 4). An essential question remains, however. The large number of ibex (Capra ibex ibex) that roams these mountain steppes is suspected to be over-utilizing its range and may face a potential population decline together with serious range deterioration (Skogland, 1976, and FAO, 1977, Project Field Document No. 4).

This report, therefore, has a dual purpose: 1) to give a general account of range conditions in central Afghanistan, using the protected area in the Ajar Valley as reference, and 2) to evaluate the Ajar Valley rangelands in terms of utilization pressure exerted by wildlife populations. It is hoped that this approach will contribute to a greater understanding of the serious problems the people of Afghanistan's central highlands are facing through environmental degradation and that it will focus Government's attention on possible measures to ease the pressures on rangelands. Furthermore, this report completes the ecological survey of the Ajar Valley Wildlife Reserve initiated by this project. Recommendations are presented for range management that is also applicable to areas outside the Reserve. The Ajar Valley is of great scenic beauty with a high tourist potential and could with proper management bring in a substantial revenue through tourism and controlled hunting and trekking, while at the same time serving as a reference area for monitoring range development in the central highland in general.

2. GENERAL STATUS OF ALPINE RANGELANDS IN CENTRAL AFGHANISTAN

2.1. Flora

The extremely diverse ecological conditions of the country, ranging from barren deserts to lush sub-tropical regions to high alpine nival regimes, have favored the establishment of a complex and varied flora, although greatly modified by human impact. At least four major floral

Acantholimon, *Ephedra intermedia* and the odd *Juniperus excelsea* may be found. The habitat is not regarded as being of any significant forage value; however, ibex appear to be browsing *Ephedra intermedia* to a considerable extent.

9- Scree

Under cliff-faces, especially in the Surkhak Bowl and under the Kohe Yakhpust and Kohe Kunda Nesar, frost erosion has caused a considerable amount of sand and gravel to accumulate on steep, loose slopes. Generally there is no vegetation on these unstable and exposed sites except for the odd invaders from surrounding steppe communities on the fringes of the screes. The screes have no forage value, but are utilized by ibex as escape terrain and bedding sites during the middle of the day.

10- Farmland

A part of the Ajar Valley extends into the eastern part of the Reserve and is intensively cultivated with wheat and rice fields. In the Ghawgasar Bowl, right below the springs, irrigated farming takes place, mostly wheat. Interspersed with the irrigated fields are poplar (*Populus* sp.), apricots (*Armeniaca vulgaris*) and junipers (*Juniperus excelsea*). A third area is farmed at the bottom of Jawzari Canyon, east of the Surkhak Bowl where the creek is used for irrigating wheat fields for about 3 km down the canyon. Farmland is not utilized by ibex, as it is located around water sources and the activity connected with farming and animal husbandry causes considerable disturbance to the ibex population.

5. CONCLUSIONS

As compared to adjacent, over-exploited rangelands, the Ajar Valley Wildlife Reserve shows throughout its history of protection, signs of general range improvement that are considered unique for the central Afghanistan highland. This is based on the following conditions:

1. For nearly 30 years the area has been protected from grazing by domestic stock, dry-farming and shrub-collection. Violations have apparently been kept at a minimum. During the same period, herds of mainly ibex and urial sheep have been using the habitats within the Reserve on a seasonal basis.

2. The pressure exerted by wildlife appears to be well below the carrying capacity of the area as indicated by:

a) Ephedra sp., a favorite forage shrub for ibex is very little used, except at a few localities. The <u>Ephedra</u> steppe, although characterized by very little snow cover which should make it a preferred winter pasture, is hardly utilized at all, indicating that winter pasture is not a limiting factor as one would expect had the ranges been over-exploited.

b) A plant succession pattern appears to take place that might eventually lead to a predominantly grass steppe community. Favored forage species, such as <u>Carex stenophylla</u> and <u>Festuca ovina</u>, have been invading and are presently dominating dry-farmed fields abandoned 30 years ago. A similar development seems to be taking place in the <u>Zygophyllum</u> steppe. At higher elevations, sedges and grasses already constitute a major part of the floral composition.

c) Although permanent water supply is limited to four localities in the eastern half of the Reserve there is no serious over-exploitation in these localities as would have been expected had the number of animals been too large.

3. The seasonal utilization patterns of wildlife in the area somewhat resembles the recommended deferred grazing system (Section 2.4.) insofar as any one area is used only certain period of the year, leaving time for proper regeneration of the vegetation.

4. The spring survey in April 1978 revealed that shrubs had only been lightly browsed during winter. Animals observed in April were all either grazing grasses and sedges or else nibbling young shoots of Artemisia spp. Additionally, there was a remarkably good regeneration, especially of Artemisia lehmanniana with numerous young plants emerging between the older individuals.

5. Skogland's (1976) assumption of strong grazing pressure, as illustrated by the high frequency of geophytic herbs, particularly Eremurus kaufmannii, was perhaps based on utilization pressure exerted before protection of the area. Once Eremurus kaufmannii has been established it will remain in the area for a length of time and is not necessarily indicative of present conditions.

6. All animals observed in April 1978 appeared to be in good physical conditions with an observed female:yearling ratio of 112:100.

When comparing the general conditions of rangelands of central Afghanistan with those prevailing within the reserve area, contradictive developments appear to be taking place. Whereas rangeland within the Reserve is assumed to be slowly regenerating from earlier heavy exploitation, the general trend of non-regulated rangelands in Afghanistan is one of steady deterioration. This unique situation provides source material for basic background information on range succession as well as retrogression. This is of vital importance and should be studied well in order to formulate future range management policies for Afghanistan.

The Ajar Valley Wildlife Reserve has enjoyed a history of efficient protection. Trespassing by nomads or neighboring farmers with their flocks sometimes occurs, as occasionally witnessed by project staff, particularly in the remote western part of the Reserve, but regular abuses seem to be effectively prevented by the present protection authorities. Complete and regular control of the entire reserve area would require a larger staff than the seven people now assigned to the area. It would also require sleeping facilities for the more remote parts of the Reserve.

The area along the river between the lodge and the canyon mouth is prime Bactrian deer habitat with dense willow thickets interspersed with green meadows having a diverse and interesting floral composition. This area has the potential to become a unique deer park where one of the wrold's endangered species can enjoy a protected natural habitat and be viewed by visitors. Properly managed, this could represent a tourist attraction of immeasurable value, a safe refuge for the small deer population, and a park of great scenic beauty where the river with its clear, clean spring-fed water greatly enhances its effect.

6. RANGE MANAGEMENT POLICIES

6.1. Objectives

Management efforts concerning the Ajar Valley Wildlife Reserve should seek to meet the following objectives:

1. To establish a reference area for monitoring range development in the central Afghanistan highlands, thereby providing guidelines for future ecologically-sound range management practices.

2. To utilize and maintain the already existing ecological capital by ensuring that the wildlife of the area may use the habitats within an ecological equilibrium with as little alteration by man as possible.

3. To preserve an area of exceptional scenic beauty which has high touristic potential.

6.2.1. Surveys

1. Regular surveys should be carried out in the Reserve and in selected non-protected areas to monitor and compare range developments under different environmental stress conditions.

2. Close watch should be kept on the ibex population and its utilization of the habitats. Any signs of the ibex approaching or exceeding the carrying capacity of the range should result in culling.

3. The above-mentioned surveys should preferably be carried out by international and national expertise provided through the Department of Forests and Range, Ministry of Agriculture.

4. The same team should formulate a detailed management plan for the area.

6.2.2. Management

1. Grazing of domestic stock, dry-farming, shrub-collecting and other abuses should be prohibited within the reserve area. Proper compensation should be provided to locals and nomads who are economically affected by the regulations.

2. Consideration should be given to establishing a deer park in the Bactrian deer habitat between the lodge and the canyon mouth. This implies removal of all domestic animals presently grazing in this area and intensive management efforts. Compensative measures will be required.

3. Shelter and sleeping facilities for wardens will be necessary in the remote parts of the Reserve to ensure efficient control of the boundaries.

4. The creek emerging from Surkhak Bowl should be permanently diverted to the western part of the Reserve as is presently done in summer. This will provide a water supply for a larger portion of the Reserve and eliminate high concentrations of wildlife ungulates around the springs.

5. Consideration should be given to establishing a tourist hunting programme for ibex.

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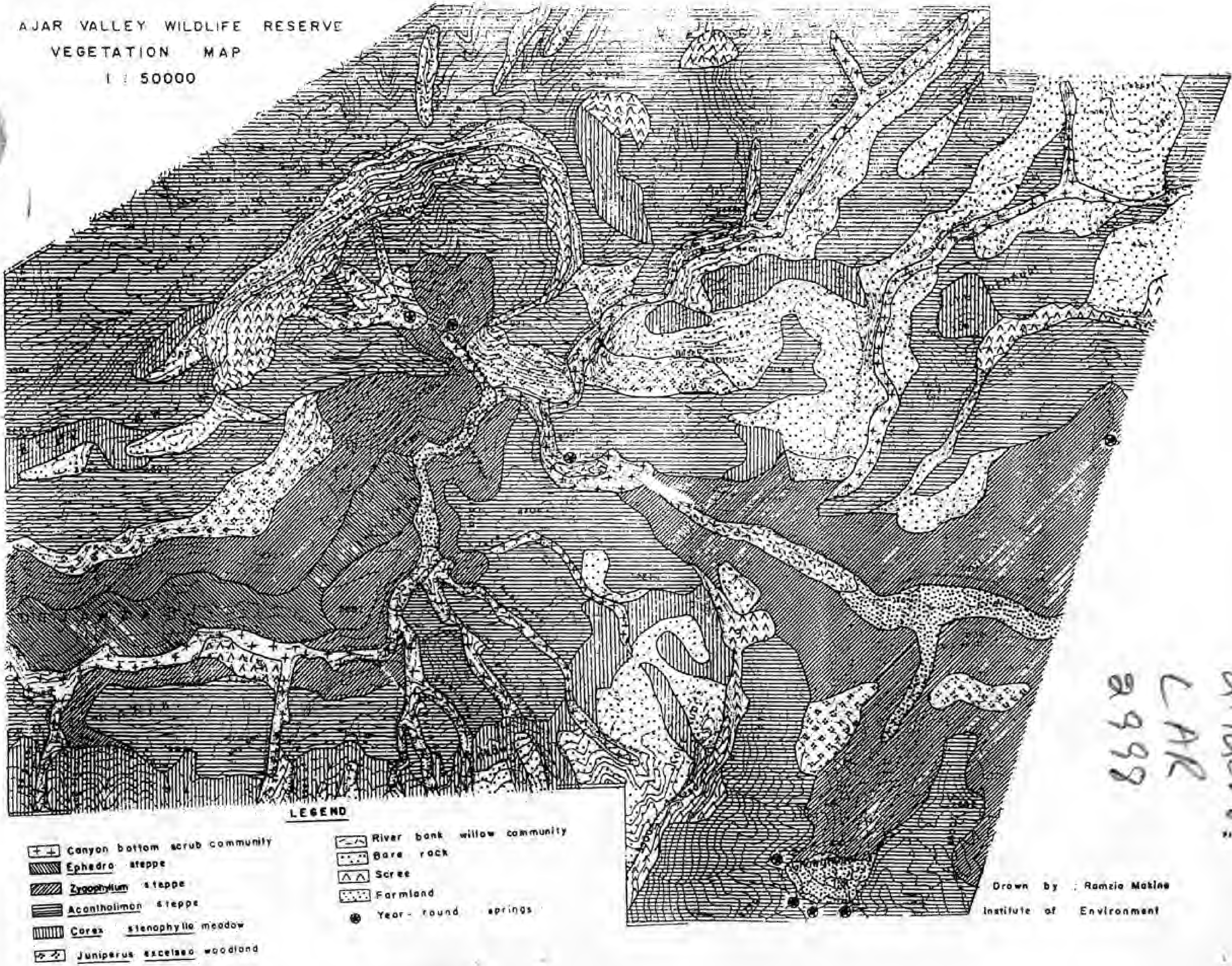
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AJAR VALLEY WILDLIFE RESERVE
VEGETATION MAP
1 : 50000



Drawn by : Ramzia Makine
Institute of Environment



Figure 2. *Artemisia - Acantholimon* steppe community above Bande Amir lakes at 3400 m elevation. At this elevation vegetation cover is comparatively good.



Figure 3. Vegetation pattern caused by disjunct snow - cover. Strong insolation on south - exposed hillsides causes variations in soil moisture regimes which effect vegetation cover. A valley near Hajigak Pass, running west - east.

regions are recognized in the country, namely the Irano-Turanian or Oriental Region, to which the central highlands belong, the Himalayan Region, the Central Asiatic Region and the Sudano-Deccanic Region. The flora of Afghanistan consists of about 3000 species (Freitag, 1972) of which some 30% are endemic to the country (Wendelbo, 1966). Some of the most common genera of the alpine steppes include a large number of species and those recorded to date are by no means exhaustive. Among the common genera are Astragalus with 180, Cousinia with 142 and Acantholimon with 41 species (Freitag, 1972; Wendelbo, 1966).

Common physiognomic features of the plants of the region are grey or white hairs, grey bark that is particularly thick at the base, reduction of leaf area and cushion growth that protect the plants against the strong insolation and dry wind and sand-drift that threaten to dry them out. Plants are often characterized by spiny stems and leaves or glands containing etheric oils or other elements that render them unpalatable to the animals that have exerted heavy impact on the flora for centuries favored the invasion development of these life forms.

Most of the central highlands are characterized by a high steppe vegetation dominated by spiny cushion-shrubs and Artemisia spp. This is not thought to be the natural vegetation of the area, i.e., that would naturally develop under such climatic conditions (Figure 2). Dieterle (1973) believes that this was originally a grass-steppe community modified by centuries of heavy grazing pressure. Freitag (1971) supposes that in vast stretches, trees and shrubs should be important components of the natural vegetation and consequently the actual vegetation should be considered as seral and a result of a very long and intense influence of man and his domestic animals. Only small remnants are now left of this original vegetation; fragments of forests, woodland and grass-dominated steppes are seen only in inaccessible areas or in areas that have otherwise been protected (Petocz, 1978, pers. comm.). Seasonal aspects of the vegetation cover display remarkable differences. In spring, when water is

abundant due to snow-melt and spring rains, countless geophytes (*Allium*, *Tulipa*, *Gagea*, *Corydalis*) occur on the mountain slopes together with a large number of annuals, mainly *Cruciferae*. These plants have, however, no protection against drought and by July only dry remnants of the spring-flowering species are left. Plants that flower in July, August or September are all chamaephytes, phanerophytes and hemicryptophytes equipped to resist drought. The dry conditions during summer, along with heavy grazing pressure, favor the development of thorny cushion-shrubs (*Astragalus*, *Acantholimon*, *Acanthophyllum*, *Onobrychis*), spiny plants (*Cousinia*, *Centaurea*), species with etheric oils (*Salvia*, *Nepeta*) and poisonous species (*Euphorbia*). In addition to these, species of the genus *Artemisia* are common, especially in areas where grazing has been moderate.

Whereas the vegetation may have a good ground coverage in spring and early summer, density diminishes as the dry season proceeds and by September the steppe vegetation generally consists of individuals scattered 1/4 to 1 m apart. This is the typical late summer and fall aspect of the steppes of intermediate altitudes which are most heavily used as summer grazing land. At higher elevations soil moisture is retained during a considerably longer period and vegetation cover improves accordingly. In valley bottoms the vegetation is favored by water from streams and irrigation channels and here entirely different plant communities develop that remain green and dense throughout the summer. Such areas are, however, always intensively cultivated and animals are normally not allowed to graze here until after harvesting. These areas are thus of limited value for overall range conditions.

2.2. Natural conditions for range development

2.2.1. Precipitation

The seasonal distribution of precipitation in Afghanistan follows the Mediterranean pattern with a maximum usually in spring and a dry period of five to seven months in summer (Freitag, 1971). Only the eastern portions

of the country enjoy the influence of monsoons and receive summer rains. Since most of the precipitation falls outside the vegetative period, the total amount of precipitation has only a limited effect on the vegetational character. In the central Afghanistan highlands snow-cover may last from December through March. The amount of snow-cover is traditionally believed to have a decisive effect on the soil water regime and the subsequent vegetation development throughout the summer. There seems, however, to be valid reasons to question this assumption. First of all, the snow, especially in the mountain areas, is exceptionally dry and has a relatively low water content. Furthermore, insolation is very strong, particularly at the time of snow-melt and a considerable amount of snow evaporates directly by subliming, without the normal water phase, and is thus lost. Also, considering frozen and sloping ground, often quite steep, there is undoubtedly a high percent of run-off with limited penetration of water into the ground.

From this viewpoint, the amount and character of the spring rain should have a considerably stronger influence on range development than the amount of snow-cover. However, climatic data show that by far the most precipitation is received in April, in some cases half of the total yearly amount. Assuming that the soil is usually saturated at this time of the year, additional precipitation would only contribute to increased run-off.

Precipitation during one year ranges from less than 100 mm in the south to over 1000 mm in the highest regions of the Hindu Kush. Average precipitation in the central highlands is estimated at 200-400 mm, increasing with altitude. As stated earlier, these figures are hypothetical as far as plant growth is concerned; the actual amount of water utilized by the vegetation is considerably less. For example, magnificent coniferous forests are found in areas receiving summer rains of about 500 mm (FAO, 1978, Project Field Document No. 9) whereas rangelands around Panjaw in the central Hindu Kush that receive 320 mm and Bande Amir with an estimated 400 mm give the impression of semi-deserts (FAO, 1978, Project Field Document No. 8).

2.2.2. Topography

Topography and exposure exert a major influence on vegetation development. The general trend is for precipitation to increase and evaporation to diminish with increased elevation. Also, snow-cover lasts longer and soil moisture is retained longer during the vegetation season. The nival zone lies above 5000 m in the Kohe Baba region (eastern Hindu Kush) where some glaciers are developed on north-exposed slopes (Breckle, 1971). The sub-nival zone and the alpine zone that descends to 4000 m have abundant soil moisture due to snow-melt and occasional summer rains combined with higher air humidity and reduced evaporation. However, extreme temperature conditions limit vegetation development. Vegetation cover is reduced and is dominated by low, frost-hardy species. The palatability of these plants is high, especially in relation to the summer palatability of plants of lower and drier elevations. Camel herds and countless sheep and goats are brought to these zones in the summer to graze (Volk, 1954). The role of exposure as an ecological factor in these areas has received controversial attention. Gilli (1969) feels that exposure is of secondary importance, as the sun is always high in summer at this latitude. Freitag (1971), on the other hand, argues that exposure is no less important than in North Europe since precipitation is highest at the time when the sun is relatively low (in winter). Consequently evaporation will be considerably higher on the south side of a hill than on the north side. My own experience is that as a rule vegetation cover is noticeably better on north-facing slopes than on south-facing ones. This is confirmed by the highly disjunct snow-cover in late winter and spring when snow still remains on north-exposed hillsides whereas on the other side of the hill soil has already started to dry out (Figure 3). Another result of this pattern may also be damage to root-systems caused by frequent and drastic ground temperature variations on southern slopes in spring.



Figure 4. Nomad (kuchi) camp located on a Carex stenophylla meadow, a favored pasture for grazing animals. On the hillsides are dry steppe communities.

2.2.3. Geology and Soils

Geology, soils, amount of snow-cover and winds also effect vegetation development, although to a lesser degree than precipitation and topography. The geology of the western Hindu Kush consists mainly of sedimentary and volcanic rocks alternating frequently within smaller regions. Gneiss and limestone are common rocks, together with schist, sandstone and conglomerates (Gilli, 1969). The effect of geological variations upon vegetation composition and distribution is notioeably weak which substantiates that this ecological factor is subordinate to precipitation and exposure.

Soils are usually only sparsely developed over large regions. They are predominantly of a Serozyom (grey soil) type with a low humus and high carbon content. Above 3000 m the humus content increases and the soils here belong to the chestnut group. The soils have almost always a basic reaction with pH-values ranging from 6.5. to 10 (Gilli, 1969). Only at very high elevations are found pH-values less than 7, i.e., having acid reaction. There is no major difference in pH-values between limestone soils and soils over granitic rocks. Soils are generally rather permeable with single grain structures and have, therefore, a low water-retention capacity. Only in valley bottoms that are commonly flooded may silty soils be found.

2.2.4. Snow-cover

The distribution and amount of snow-cover as an ecological factor becomes accentuated at higher elevations and in areas with rugged topography. Snow drifts off ridges and peaks and accumulates in depressions where soil moisture is retained far longer than elsewhere. In such areas are commonly found dense Kobresia-Carex stenophylla meadows that are favored grazing land for wild and domestic animals (Figure 4). Distinct zonation is sometimes apparent, from these depressions through intermediate community types to

plant communities characterized by a selection of frost-resistant species on exposed areas that have little snow-cover.

2.2.5. Temperature

The central Afghanistan highlands are characterized by a typical continental climate. During the warm, dry summers air humidity is low (25-30%) and evaporation accordingly high. In September night frosts begin and the temperature drops until May when the mean temperature reaches 10°C and nights are free of frost. The vegetation period varies from two to six months according to elevation.

2.3 Human impact

Man and his domestic animals have exerted a profound influence upon the environment in Afghanistan for hundreds if not thousands of years. The large number of highly significant remains of past cultures that are scattered throughout the Hazarajat and adjacent areas points to a heavy concentration of people with a rather advanced life-style. The old trading route between the eastern and western worlds passed through the center of this area and was most likely responsible for the many settlements and the subsequent land utilization. Environmental conditions would naturally favor a pastoral life-style rather than crop cultivation. Nomads that in former times passed through these areas with their animals had a profound impact on the land. There is still a considerable number of people (an estimated 3 million) that lead a pastoral life in Afghanistan bringing their animals and all their belongings from winter quarters in the lowlands of neighboring countries to summer grazing grounds in the central Afghanistan highlands.

The nomads are sometimes regarded with suspicion by farmers and settled people who accuse them of criminal offenses, of disrespectful behavior and of land degradation. On the other hand, nomads feel superior to most other people and claim the traditional rights to land usage that have been practised since before sedentary agriculture began. The various tribal segments of the nomads do not claim land so much as the right to occupy rangeland at certain times in the annual cycle. The load of animals on any particular pasture will thus vary during the seasons. Traditionally these loads were adjusted to the changing carrying capacity of the pastures (Barth, 1975). As ranges deteriorate grazing is now often carried out on a first come, first served basis.

Human impact on rangelands may roughly be divided into three major components: grazing of domestic stock, uprooting of shrubs and dry-farming.

2.3.1. Grazing of domestic stock

Nomads as well as sedentary farmers follow different livestock herding patterns. The former base their husbandry on year-round grazing, moving their herds to areas suitable for grazing at any one time of the year, arriving in the central Afghanistan highlands in April and May and leaving during September. Sedentary farmers keep their animals sheltered during the coldest period of the year when they are fed on fodder that has been either cultivated, or collected from the rangeland or stream- and irrigation-channel banks during summer. In the spring shepherds move the animals to the range where they remain all summer. The time of departure is often determined by the scarcity or abundance of winter fodder. In the fall when the mountain weather gets too harsh, the animals are taken down to the valleys to graze on stubblefields and remaining vegetation.

STATUS OF ALPINE RANGELANDS IN CENTRAL AFGHANISTAN WITH SPECIAL REFERENCE TO THE AJAR VALLEY WILDLIFE RESERVE



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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Field Document No. 1

National Parks and Utilization of Wildlife Resources

A F G H A N I S T A N

STATUS OF ALPINE RANGELANDS IN CENTRAL AFGHANISTAN WITH SPECIAL REFERENCE TO THE AJAR VALLEY WILDLIFE RESERVE

Prepared by

John Y. Larsson
Associate Expert, FAO

UNITED NATIONS DEVELOPMENT PROGRAMME
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
DEPARTMENT OF FORESTS AND RANGE, MINISTRY OF AGRICULTURE

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ABSTRACT

The report presents an introduction to the status of alpine rangelands in central Afghanistan with comments on the most common abuses. Recommendations include the establishment of a reference area, represented by the Ajar Valley Wildlife Reserve, in order to monitor range developments and provide guidelines. A survey of predominant plant communities is presented together with range management recommendations. A vegetation map is shown in Appendix I.